Title: Show Me the Graphs!

Brief Overview:

In this learning unit, students will be given sets of data, and they will have to construct various kinds of graphs. They will learn how to properly interpret graphs and write evaluative statements about the graphs. Students will explore meaningful uses of statistics in the real world. From given sets of data, they also will learn how data can be misrepresented in ways that lead to deceptive information. Lastly, they will have the opportunity to use the graphing calculator to design, create, and interpret graphs.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

Number and Operations
Students will demonstrate their ability to solve problems using arithmetic operations with technology. They also will use computational tools and strategies.

Geometry
Students will select and use different representational systems, including coordinate geometry and graph theory

Data Analysis and Probability
Students will demonstrate their ability to organize and display data; analyze and interpret box-and-whisker plots and bar graphs; interpret data using methods of exploratory data analysis; and calculate the measures of central tendency.

- **Process Standards**

  <u>Mathematics as Problem Solving, Reasoning and Proof, Communication, Connections, and Representation</u>
  These five process standards are threads that integrate throughout the unit, although they may not be specifically addressed in the unit. They emphasize the need to help students develop the processes that are the major means for doing mathematics, thinking about mathematics, understanding mathematics, and communicating mathematics.

  Students will select and use various types of reasoning and methods of proof as appropriate. They will use the language of mathematics as a precise means of mathematical expression. Students will create and use representations to organize, record, and communicate mathematical ideas effectively.

Links to MSDE Writing Learning Outcomes:

- **Writing to Inform**
  Students will write an informative paragraph describing real-world graphs.

- **Writing to Persuade**
  Students will write to persuade their teacher on which grade they should receive based on the statistical analysis of their given data.

Grade/Level:

This unit is particularly relevant for seventh and eighth grade students.

Duration/Length:

Five days

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Ability to use TI-73 calculators
- Basic calculations and computations
- Number operations
- Applications of graphing
- Ability to determine the measures of central tendencies

Student Outcomes:

Students will be able to:

- create bar graphs and box-and-whisker plots.
- manipulate data.
- analyze data and make decisions based on a variety of factors.
- find the measures of central tendency.
- use basic functions of a graphing calculator.
- choose appropriate graphs given a set of data.
- write a persuasive argument based on graphs they have created.

Materials/Resources/Printed Materials:

- Index cards with a "test grade" written on each one
- Graphing calculators (one per student)
- Unifix cubes (anything that can be counted)
- Graph paper
- Rulers
- Student worksheets (included)
- Websites:
  http://baseball.lycos.com/sports/pbb/pbb_statistics.jsp
  http://www.gametrends.com/demograph.asp
  http://espn.go.com/nfl/statistics
  http://www.op.state.md.us/MSDC/HH_Income/median98.htm
  http://www.epa.gov/ceisweb1/ceishome/ceisdocs/usguide/026b(1).txt

Development/Procedures:

Day One: Body Graphs
Students will have the opportunity first to discover the meaning of mean and mode upon entering the classroom. Then the teacher will lead them to create a box-and-whisker plot using their own bodies. Lastly, students will be directed to form a bar graph, without speaking, from the birth dates and months in which they were born. After each of the activities, students will be directed to take notes and complete a student worksheet. The purpose of the worksheet is to prompt individual thinking about topics learned in class.

Day Two: Real-World Interpretation
Students will be given a bar graph to interpret. They will generate a series of statements about the graph. A second set of data will be used to construct three separate bar graphs varying the y-axis (scale). Students will write one paragraph describing one of the graphs.

Day Three: Calculator Activities
Students will be instructed on how to create bar graphs and box-and-whisker plots using the graphing calculator. They will be given the chance to explore to find the effects of changing various parameters on each scale. Students also will learn how to use the calculator to find the measures of central tendency.

Day Four: Calculator Activities (continued)
Students will continue working with the graphing calculator. They will create line graphs based on real-world statistical information. They will discover the effects of using appropriate scales when creating and interpreting graphs.

Performance Assessment: Day Five

Students will analyze a set of data, construct a bar graph or box-and-whisker plot, and write a persuasive argument.

Extension/Follow Up:

- Students will use the Internet to locate graphs and write informative or persuasive arguments.
- Students will learn how to enter their data on the graphing calculator.
- Students will manipulate the appearance of their graphs to enhance data.

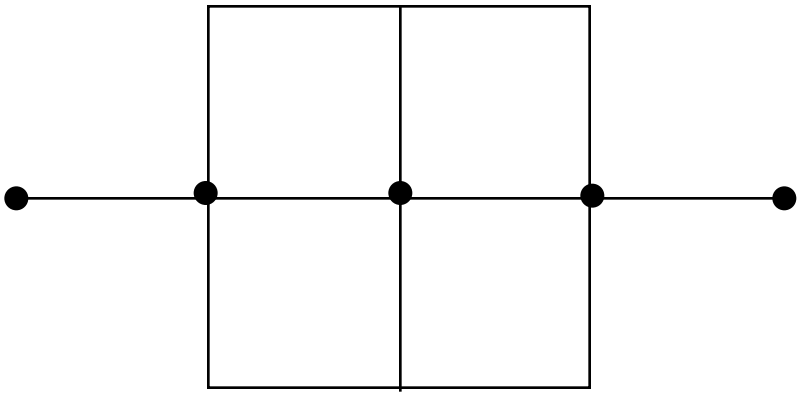
Authors:

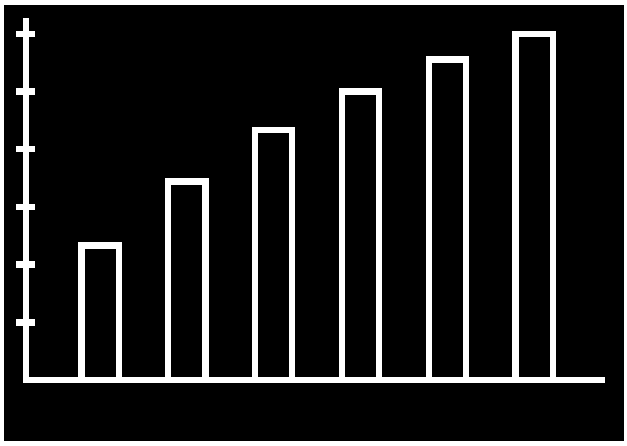
Rena Stevens
Benjamin Stoddert Middle School
Prince George's County, MD

Bruce Eberwein
Martin Luther King Middle School
Prince George's County, MD

Jacquelyn Johnson
Southern Middle School
Calvert County, MD

Show Me the Graphs!





Teacher Resource Day 1

Teacher Preparation: Have one index card to give each student with "test grades" on each. (for 25 students: 1-100, 3-B's, 10-C's, 9-D's, and 2-E's. (Note: Teacher holds on to these scores to reuse on Day 3.)

Activity One: Mean & Mode

Definitions: Mean - the average of a group of numbers
Mode - the number that occurs the most

1- Have students pick up as many cubes as they can hold in one hand upon entering room. When they go to their seats, have them count the number of cubes they have.
2- Tell them to get in groups with other students that have the same number of cubes as they have.
3- Teacher holds class discussion to find out the number of cubes represented by each person in each group.
4- Explain that the group, that occurs the most, represents the mode.

(Have students return to their seats and complete #s 1-4 on the Worksheet 1-A.)

5- Assign students to groups of 4 to 8.
6- Pose the following questions:
   a. If each cube represents $1, is it fair how the money was distributed?
   b. How could we make it fair?
7- In groups, have students discuss the questions and then solve them.
8- Have students answer questions 5-8 on the Worksheet 1-A.

Activity Two: Body Box-And-Whisker Plot

Definitions: Lower Extreme - the lowest number
Lower Quartile - the middle of the lower half of numbers
Median - the middle number
Upper Quartile - the middle of the upper half of numbers
Upper Extreme - the highest number

1- Pass out the index cards with the "test grades" on them.
2- Have students line up from least to greatest.
3- Tell them to find the middle and have that person step forward. (Discuss what happens when there is no middle).
4- Have them separate into two separate groups.
5- Tell the lower half of kids to find their middle and have that person step forward.
6- Repeat step 5 for the upper half.
7- Tell the highest and lowest numbers to also step forward (the extremes)
8- Find the range.
9- Teacher records "test grade" data on the board.
10- Have students answer questions 9-15 on the Worksheet 1-A.

Activity Three: Body Bar Graph

1- Tell kids to line up according to their birth month without talking.
2- Those with similar birth months then must stack themselves by date in order.
3- Teacher checks to see if it was done correctly.
4- Ask what kind of graph they formed.
5- Have students write their birth date and month on the board.
6- Answer questions 16-17 on the Worksheet 1-A.

Worksheet 1-A (Body Graphs)

1. How many cubes do you have?

_____
_____

2. What was the mode of the class?

_____
_____

3. What is the definition for mode?

_____
_____

4. Find the mode of the given data: 3, 7, 8, 2, 3, 4, 0, 8, and 3

_____
_____

---

5. Why wasn't the distribution of the cubes fair if each cube represented a dollar?

_____
_____
_____
_____

6. What did your group do to make it fair?

_____
_____
_____
_____

7. What is the definition for mean?

_____
_____

8. Find the mean for the data given in question 4.

_____
_____

---

9. What is the first thing the class did to begin the box plot?

_____
_____

10. What do you do if there is no one middle number?

_____
_____

11. What do you do after finding the middle number?

_____
_____

12. What are the highest and lowest numbers called?

_____
_____

13. What is the name of the middle of the lower half?

_____
_____

14. What are the five points needed to create a box-and-whisker plot?

_____
_____

15. Using the test grade data that was just gathered, create a box plot. Be sure to include a number line.

---

16. Name at least three things that all bar graphs must have?

_____
_____
_____
_____

17. Create a bar graph from the birthday data. Be sure to use a straightedge.

Teacher Resource Day 2 - Interpretation

As a result of this activity the student will be able to read and interpret two bar graphs. The students will analyze the bar graph, write two paragraphs, and suggest topics of further inquiry.

A. Introductory Activity

Students will write two true and two false statements about the data collected from the body bar graph from Day One.

B.Guided Developmental Activity

Using Graph Number 2-A (Video Game User Demographics),
and the Worksheet 2-B the students work in groups of two to three to generate three statements for each category (know, don't know, and not sure).

Create an overhead of Worksheet 2-B. As a class, have students fill in "Know, Don't Know, Not Sure". Have the class complete B and C from Worksheet 2-B. Create a model paragraph including an opening statement, two to three significant details, and a conclusion.

Hypothesize how this information might be presented in a different format, and whether that format would change the message of the graph.

C. Independent Activity

Pass out Worksheet 2-C (Extra Points for the NFC). There are three graphs displayed, each displaying the same information in three different formats. Students are to complete Worksheet 2-B and write one paragraph about one of the Graphs (A, B, or C) describing the information each graph is presenting.

D. Assessment

Each student should have a complete paragraph with a topic sentence, two to three details, and a conclusion. Draw student attention to the construction of the three graphs, pointing out the variety in the y-axis, and noting how that decision influences the message of the graph.

E. Extension

Have students bring in graphs from newspapers or periodicals to be analyzed in paragraph form.

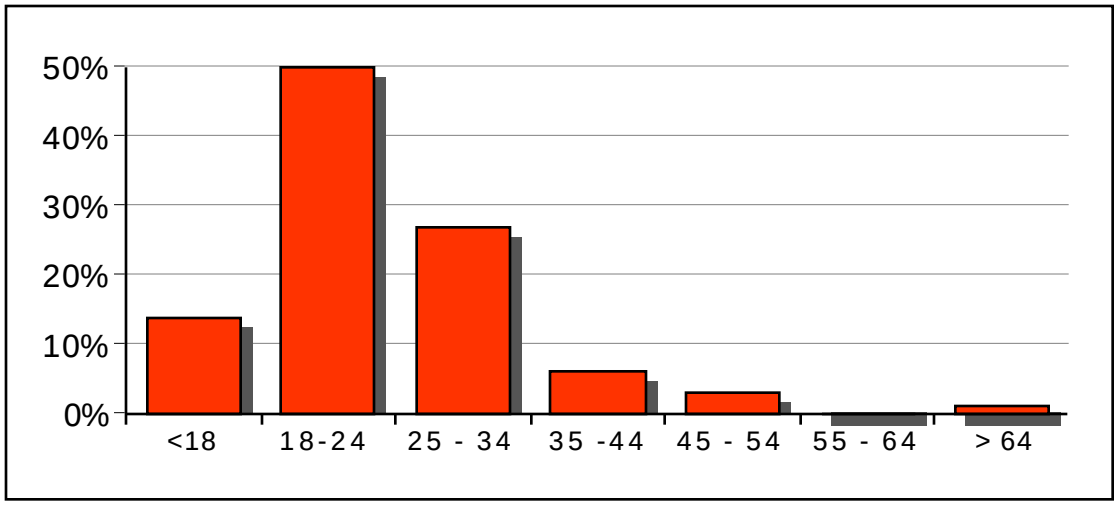
Ask students to further analyze the data from Worksheet 2-D
Does this data tell us anything about which is the better kicker?

Worksheet 2-A

Video Gaming Statistics, Demographics, Market Research
as provided by www.gametrends.com from online responders.

Video Game User Demographics by Age

<18	14%
18-24	50%
25 - 34	27%
35 -44	6%
45 - 54	3%
55 - 64	0%
> 64	1%



WORKSHEET 2-B

KNOW	DON'T KNOW	NOT SURE
1		
2		
3		
4		

********** **********

B. In the space provided write a topic sentence for a paragraph describing the information contained in our graph.

_____

_____

_____.

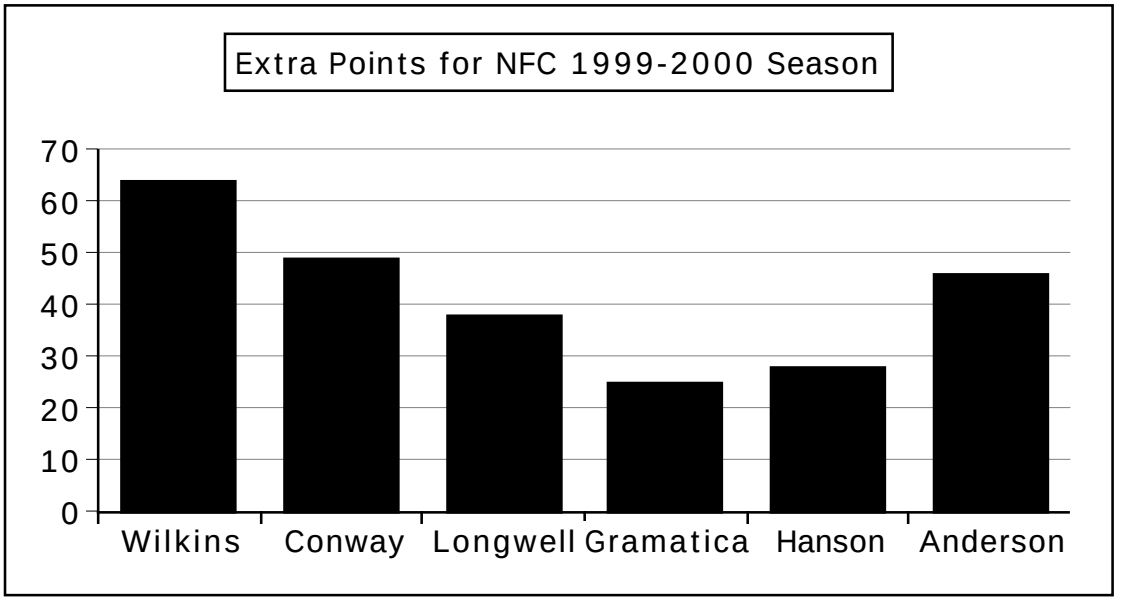
C. What is the most important detail you would include in our paragraph?

_____

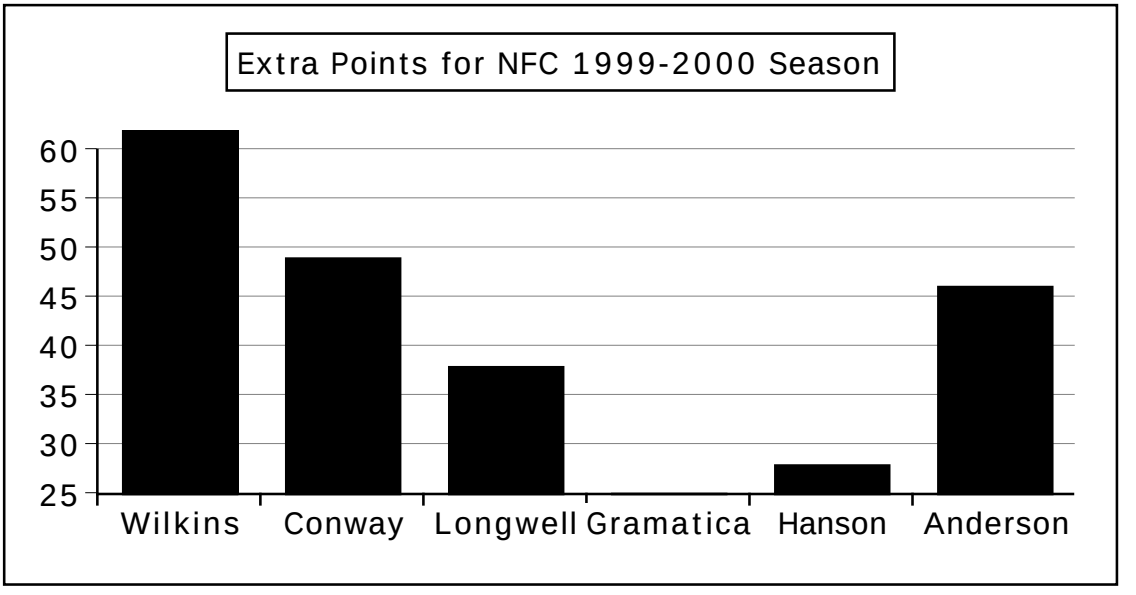
_____.

Worksheet 2-C

Graph A

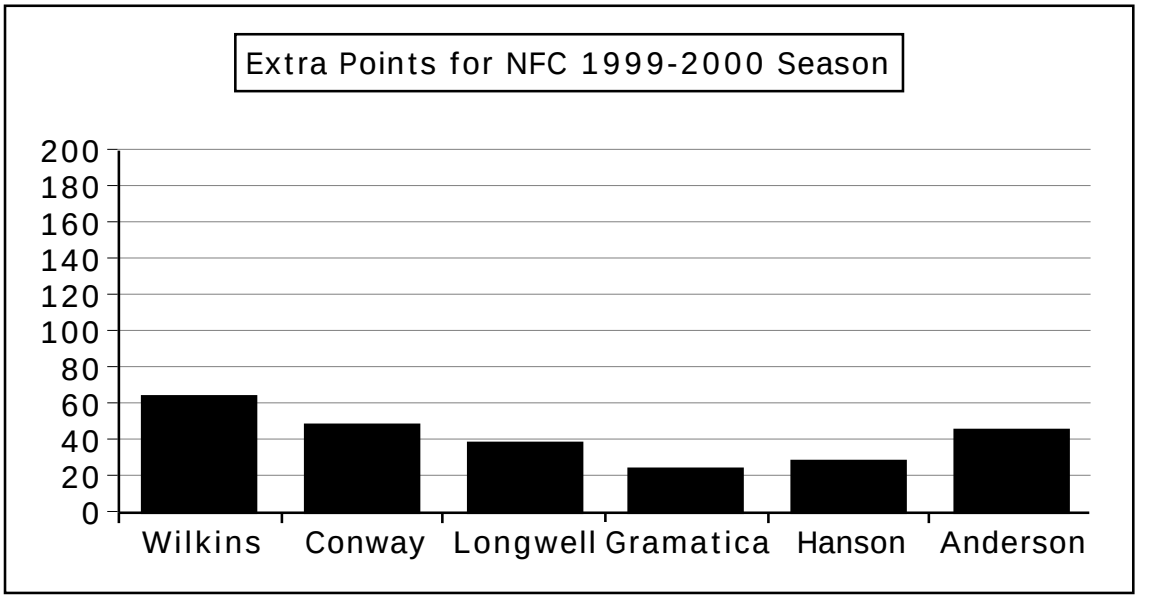


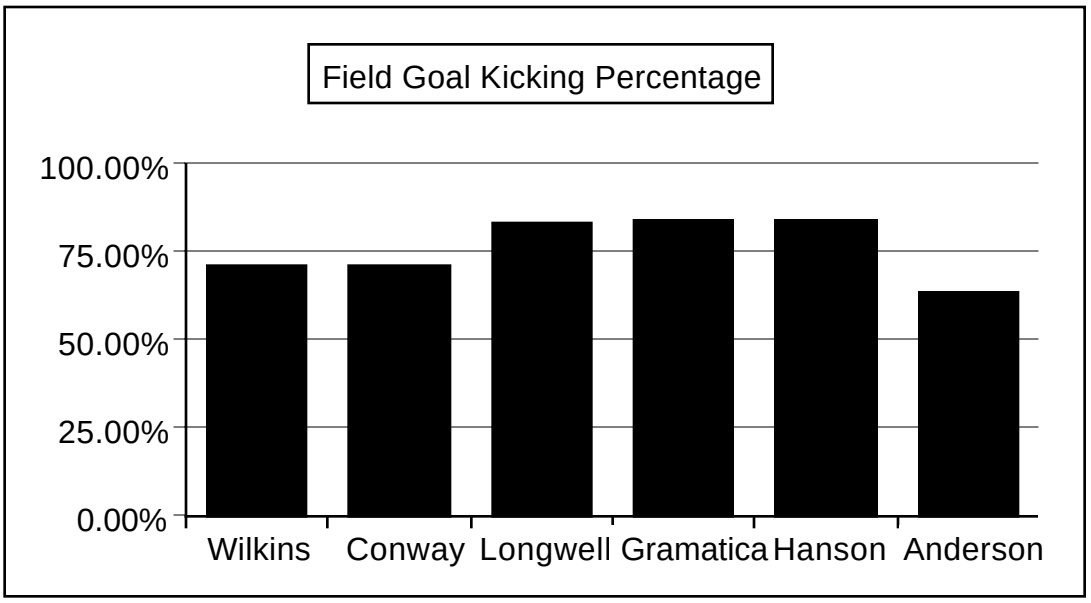
Graph B

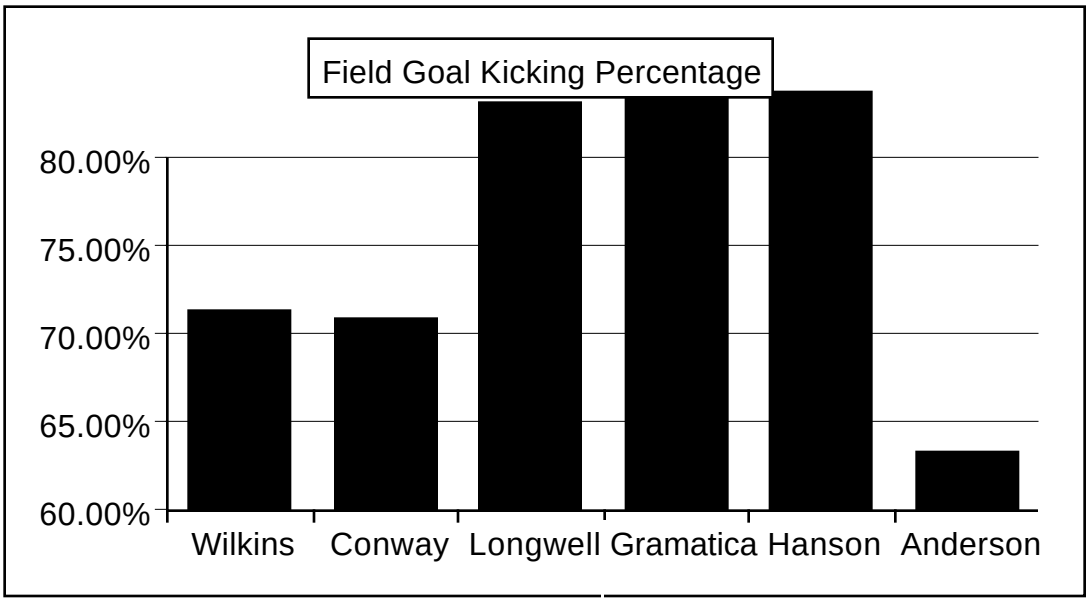


Worksheet 2-C

Graph C




Field Goal Kicking Percentage
100.00%
75.00%
50.00%
25.00%
0.00%
Wilkins
Conway
Longwell
Gramatica
Hanson
Anderson


Field Goal Kicking Percentage
80.00%
75.00%
70.00%
65.00%
60.00%
Wilkins
Conway
Longwell
Gramatica
Hanson
Anderson

Teacher Resource - Days 3 and 4

Day Three

1. Give students a copy of the TI-73 directions.
2. You may want to place the students in pairs to complete the activities.
3. Have students complete problems 1-5 on the Worksheet 3-A.
4. Have students pull out the box-and-whisker plot from Day 1.
5. Have the students then complete problems 6 and 7.
6. Have a discussion comparing the two graphs they sketched from Monday and the one on the calculator.
7. Have students complete questions 8 through 17.

Day Four

1. Give students a copy of the TI-73 directions.
2. Give each student a copy of Worksheet 4-A.
3. Give students a copy of the Oil Spill data.
4. Ask students on their own to complete question one on their worksheet.
5. After allotted time, have a class discussion about their answers.
6. You may or may not want your students to work with a partner for the rest of the class period.
7. Have students complete questions 2-8.
8. You may want to extend this by having the students find the measures of central tendency.

Worksheet 3-A

1. Follow the set of directions to clear all lists and turn plots off.
2. Enter the test score data from Day 1 into list one.
3. Follow the directions for finding central tendency on the TI-73.
4. What was the Mean_____
   Median_____
   Mode_____
5. If your teacher was to give you an overall grade using one of the measures of central tendency, which one would you want your teacher to use and why?

_____
_____
_____
_____
_____

6. Follow the directions to create a box-and-whisker plot on the graphing calculator.
7. Sketch the graph in the space below.

8. Press the List key to return back to your data. Highlight the largest number and press the DEL key to delete it. Do the same with the smallest number. What did we do to our set of data?

_____
_____

9. Press zoom and select Zoomstat. Sketch the new graph below.

10. Compare the two graphs.

_____
_____
_____

11. What happens to our graph when we eliminate the outliers? Why?

_____
_____
_____
_____

12. Go back and change the graph to the original box-and-whisker plot. Press the window key. Change the Xmax to 25 and Xmin to -10. Describe what happened to the graph.

_____
_____
_____

13. What could you change the Xmax and Xmin to so that the graph would be extra long?

_____
_____

14. Take the data that you entered for the box-and-whisker plot and create a frequency table to show the amount of students with A, B, C, D, and E's.

15. Follow the directions for creating a bar graph on the TI-73. Sketch the graph below.

16. Compare the bar graph with the box-and-whisker plots.

_____
_____
_____
_____

17. Which graph would you choose to show your parents?

_____
_____
_____
_____

Worksheet 4-A

1. What can you conclude from the given data?

_____
_____
_____
_____
_____

2. Using your TI-73, enter the following data into L1. 1970, 1975, 1980, 1985, and 1990. Choose weather you want to display, number of oil spills, or volume of spills. Enter the data you chose to display for the years in L1 into L2. Turn your plot on and choose a line graph. Make sure your X value reads L1 and your Y value reads L2. Graph the line by pushing zoomstat. Sketch the graph below.

3. What conclusions can you make based on the graph?

_____
_____
_____
_____

4. Using the window key, change the Ymax and to make the line graph look very close to a horizontal line. Sketch the graph below.

*What did you set you Ymax and Ymin to be?

_____

5. What conclusions can be made based on this graph?

_____
_____
_____
_____
_____

6. Use the window key and change the Ymax and Ymin so that the line of the graph falls between the two graphs you just made. Sketch the graph below.

*What did you set your Ymax and Ymin to be?

_____

7. What conclusions can be made from this graph?

_____
_____
_____
_____
_____

8. Comparing all three graphs, Describe a situation where you would have to use each different orientation of the graph.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Worksheet 4-B
Data to be Used on Day 4

Oil spills in and around the United States, 1970-1992

Year	Number (thousand spills)	Volume (million gallons)
1970	3.71	15.25
1971	8.74	8.84
1972	9.93	18.81
1973	11.05	15.29
1974	12.08	15.74
1975	11.00	21.53
1976	11.07	18.52
1977	10.98	8.19
1978	12.17	11.04
1979	11.56	10.05
1980	9.89	12.64
1981	9.59	8.92
1982	9.42	10.41
1983	10.53	8.38
1984	10.09	19.01
1985	7.74	8.47
1986	6.33	4.43
1987	6.08	3.76
1988	6.16	6.62
1989	7.92	13.51
1990	6.90	11.38
1991	9.85	1.45
1992	8.79	1.50

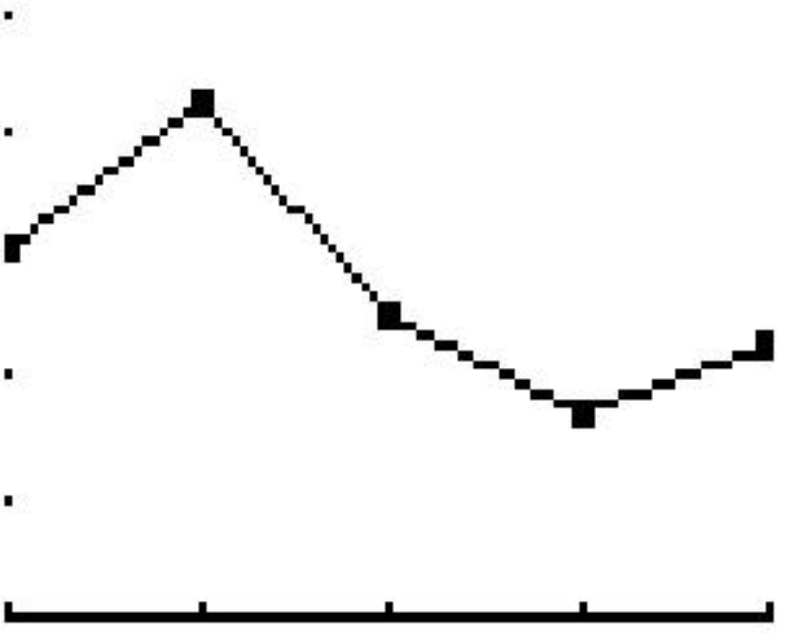
Source: U.S. Department of Transportation, Coast Guard. Polluting Incidents In and Around U.S. Waters (Washington, DC: DOT/USCG, 1986), and unpublished data.

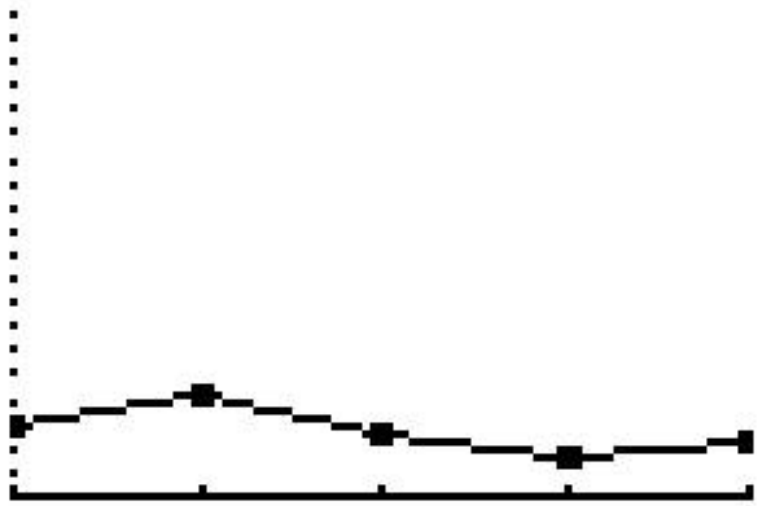
Example of Day 4 Activity

Same data in TI-73, imported through TI-Graph Link:

L1	L2	L3 2
1970	15.25	------
1975	21.53	
1980	12.64	
1985	8.47	
1990	11.38	
------	------	

L2(1) =15.25





DAY 5 - ASSESSMENT

STEP ONE: During the past quarter your class has been studying fractional numbers and the metric system. While you did very well during the unit on fractional numbers, some of your scores during the unit on the metric system weren't very good. Listed below are the 25 scores you received during the quarter. Your teacher has told you that you will be receiving a B for the quarter. You wish to convince her she was wrong.

Analyze the 25 scores to determine the central tendencies(mean, median, mode). Construct a "box-and-whisker" or a bar graph to display your data. Write a paragraph to your teacher explaining to her why you think you deserve an A for the quarter, not a B . Reference your graph in the paragraph.

********** ********** **********

SEPTEMBER SCORES: 95,92,94,100,96,88,95,92,90,90

OCTOBER SCORES: 86,100,97,90,90,94,98,94

NOVEMBER SCORES: 92, 80,60,82,75,52,80

MEAN:_____

MEDIAN:_____

MODE:_____

RANGE:_____

SCORING GUIDE FOR TEACHERS

A. DETERMINE THE CENTRAL TENDENCY OF A SET OF DATA:

2- Data is correct and clearly indicated.
(MEAN-86; MEDIAN-92; MODE-90;RANGE-48)

1- Data is largely correct. Errors are within a tolerable range(+/- 3 points).

0- Data is grossly inaccurate.

B. CONSTRUCT A BAR GRAPH OR BOX-AND-WHISKER PLOT

2- Title; accurate display of data; x and y axis are identified on the bar graph; all five points displayed on the box-and-whisker plot; neat; appropriate size; easy to read.

1- Title; minor errors in display of data; x or y axis identified on the bar graph; some points displayed on the box-and-whisker plot; legible.

0- Little effort made to display data accurately or legibly. Unsuitable to display or persuade.

C. WRITE A PARAGRAPH TO PERSUADE YOUR TEACHER.

3- The paragraph contains an opening sentence, two or three supporting details; and a conclusion. Numerical information is used in a persuasive manner, and attention is drawn to the graph. Spelling and punctuation mistakes do not take away from the paragraphs meaning.

2- Organization is obvious, but some elements of a persuasive essay are missing. Numerical information is used. Spelling and punctuation mistakes are infrequent and do not take away from the overall persuasive argument.

1- Organization is weak. Little numerical information is used. Many mistakes in language usage.

0- No effort made to create a persuasive argument.

Additional Teacher Resources for Day 1
Body Graphs

-As students enter the classroom, on their desks place one index card turned upside down with the following "test grades" written on them. (For a class with 25 students: 1-100, 3-B's, 10-C's, 9-D's, and 2-E's.)

-Tell the students to leave the cards alone until instructed to do otherwise. As they enter the room, tell them to pick up a handful of cubes. Once they are seated, have them count and one at a time tell you how many cubes they each have. Record the data on the chalkboard. Ask them which number occurs the most. Explain that this number is called the **mode**. If there are two numbers that occur the most, it is known as bi-modal. If there are more than two numbers that appear the most, the data is multi-modal. If there is no number that occurs the most, there is simply no mode. Tell them to pretend each cube is a dollar bill, and they have the opportunity to buy as many video cartridges as they like. Ask if they think this is fair? Hopefully they will say no because everyone doesn't have the same amount of cubes. Then ask how can this situation be made fair. Students should respond- count the total number of cubes that everyone has, and then divide the total number of cubes by the number of students in the class. Tell students to add up all of the number of cubes that was recorded on the board. Then collect all of the cubes. Ask students how many cubes each student should get. They should divide to get their answer. Explain that what they just did is calculate the **mean,** or the average.

-Give the students three groups of numbers (feel free to include decimals, integers, and numbers in the hundreds and thousands).

-Now have students flip the card on their desk. Ask them to form a line in the front of the room. Then have them line up in order from least to greatest without talking, using the numbers on their cards.

-After students get in the correct order, tell them to find the middle number without talking. Students may peel off from the ends of the line until one person is left standing, which will be the middle number. If there are two numbers left in the middle, students must find the average of those two numbers. Tell students that this is known as the **median**, or middle number.

-Ask students what the **extremes** or **outliers** are. They should say the lowest and highest number. These are commonly called the **upper and lower extremes**.

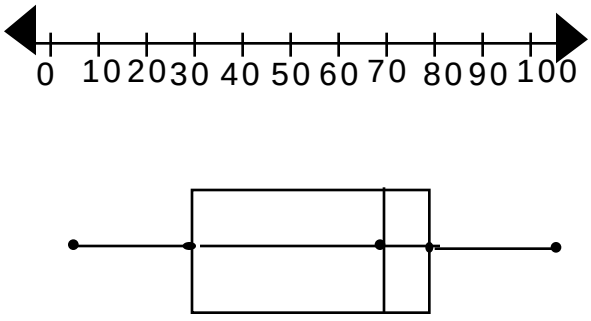
-After students find the median, tell them to split into two even groups. Explain that now we have an upper half and a lower half. Now tell the lower half to find the middle or median of their group of numbers. This is known as the middle of the lower half or the **lower quartile**. Ask the upper group to find the middle of the upper half, also known as the **upper quartile**.

-While students are still standing, ask how we could find out how wide of a span of numbers we have represented. Show kids that in order to find the **range**, they must subtract the lowest number from the highest number.

- Ask students what the mode is of the numbers. It should be whichever number occurs the most.

-Explain that what they just did was to separate the numbers into four equal groups and now we can create what is known as a **box-and-whisker plot**. Explain that each section of numbers represents 25%. The five points that we just found (UE- Upper Extreme, UQ- Upper Quartile, M- Median, LQ- Lower Quartile, and LE- Lower Extreme) are the five points needed to create a box-and-whisker plot or also sometimes called a box plot.

-Have students sit down and begin taking notes. Record the numbers the students had on their cards by having them call the numbers out (in no particular order). As you record the numbers on the board, students should record also. Then ask the students what we did first when they came up. They should say, put the numbers in order from least to greatest. Students should put the numbers in order on their papers. Continue asking questions and having students follow the proper steps to creating a box plot. Make sure they create a number line and the box plot should be drawn under the number line. It should look something like this:



Creating a Body Bar Graph

-After discussing the significance of the information retrieved from the box plot, tell students that they are going to create a bar graph using their bodies. Tell them to think of the month and day they were born in. They are going to tell each other when they were born using their hands only (once again - no talking). For example, if someone was born on November 3rd, they would show an 11, then a 3.

-Tell them to think of what a bar graph looks like. Show them where you want January and December to be. If there are multiple birthdays in a month, students should "stack" themselves forming a "bar" where they are standing in front of each other. The students should stand from least to greatest with the earliest birth date first.

-Make sure as the students are doing the activity, they are not talking and they leave an empty space where there are no birth dates in a particular month.

-Once students have completed the body graph, the teacher should go down the row checking to see that they did it correctly.

-After the activity has been checked, have students sit down, call out their month and date of birth, and both the teacher and students should record the data.

-Then model on the chalkboard how they should do their graphs using rulers, labeling the horizontal axis: Months of the year, and the vertical axis: Frequency (# of students born in each month)

- Make sure as the students create their graphs: their bars are not touching, they use some type of straightedge, they have a title, label each axes, and have scales with appropriate intervals.

-For homework, make an assignment where they must use a set of data to:

-create a box-and-whisker plot
-find the mean, median, mode, and range
-create a bar graph

Directions for TI-73 Graphing Calculator

To Clear all lists and turn all plots off...

(You may want students to do this before they enter data into their lists or at the end of the lesson)

1. Press 2nd 0 (memory key)
2. Arrow down to number 6 ClrAllLists
3. Press enter twice

To Find Central Tendency:

1. Input Data
    a. Press the list key
    b. Enter data into L1
    c. Arrow down or press Enter after each entry
2. To organize data in ascending order
    a. Press 2nd List (STAT)
    b. Arrow to the right once highlighting OPS
    c. Highlight 1 and press enter
    d. Press 2nd List (STAT)
    e. Highlight the list you want to sort and press enter
    f. Close parenthesis and press enter
3. To find the Mean
    a. Press 2nd List (STAT)
    b. Arrow to the right twice to highlight Math
    c. Arrow down to Mean and press enter
    d. Press 2nd List (STAT)
    e. Highlight the list you want and press enter
    f. Close parenthesis and press enter
4. To find the Median
    a. Press 2nd List (STAT)
    b. Arrow to the right twice to highlight Math
    c. Arrow down to Median and press enter
    d. Press 2nd List (STAT)
    e. Highlight the list you want and press enter
    h. Close parenthesis and press enter
5. To find the Mode
    a. Press 2nd List (STAT)
    b. Arrow to the right twice to highlight Math
    c. Arrow down to Mode and press enter
    d. Press 2nd List (STAT)
    e. Highlight the list you want and press enter
    h. Close parenthesis and press enter

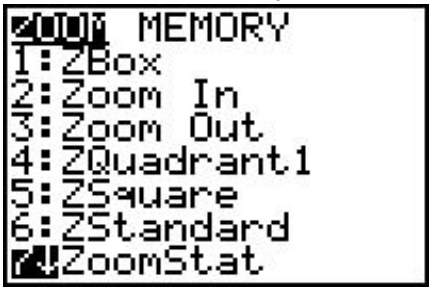
To Create a Box-and-Whisker Plot:

1. Input Data
    a. Press the list key
    b. Enter data into L1
    c. Arrow down or press Enter after each entry
2. To Choose a Plot
    a. Press 2nd Y=
    b. Press enter to choose plot one
    c. Highlight ON and press enter
    d. Arrow down once
    e. Arrow to the right until the first box-and-whisker is highlighted.
    f. Press Enter
    g. Arrow down once
    h. Make sure Xlist reads L1.

*If it does not read L1, follow the following directions

1. Press 2nd List
2. Highlight L1
3. Press enter

    i. Arrow down once
    j. Make sure Freq reads 1
    k. If not press 1
3. To display the Plot
    a. Press Zoom
    b. Arrow down to number 7 and press enter



4. To Trace the graph
    a. Press the Trace key
    b. Arrow to the right and left to read the graph

To Create a Bar Graph:

1. To input data into one list
    a. Press the List key
    b. Arrow to the right until you get a column with out a title
    c. Press 2nd MATH (Text)
    d. Type Grades using the text box
    e. Arrow to done
    e. Press enter twice
    f. Arrow down into the list
    g. Enter the following using the text box
        "a" "b" "c" "d" "e" (each letter must be in quotes)

h. Press enter twice after each letter

2. To input data into the other list
    a. Arrow to L2
    b. Enter you numerical data
    c. Press enter after each number
3. To choose a Plot
    a. Press 2nd Y=
    b. Arrow down to 2 and press enter
    c. Highlight ON and press enter
    d. Arrow down once
    e. Arrow to the right until the bar graph is highlighted and press enter
    f. Arrow down once
    g. Press 2nd List (stat)
    h. Arrow down until Grade is highlighted and press enter
    i. Arrow down once
    j. Make sure Data List 1 reads L2 (follow directions above)
    k. Arrow down 3 times and highlight Vert and press enter
    l. Arrow to the right and highlight 1 and press enter
4. To display the graph
    a. Press Zoom
    b. Arrow down to number 7 and press enter
5. To Trace Graph
    a. Press this Trace key
    b. Arrow right or left to read the graph

To Manipulate the Graphs Using the TI-73 for the Box-and-Whisker Plot:

1. Press Window
2. Change Xmin and Xmax
    a. this will make the graph longer or shorter